

Part No. 1F8039

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Kodak Medical X-ray Processor, Model 104

Operator Manual



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Introduction

The Kodak processor is a compact, automatic table-top sheet film processor. The film materials are developed, fixed, rinsed and dried. The processor has automatic film-registration and a Stand-by mode. The developing solutions are temperature-regulated, circulated and automatically replenished.

This User's Guide contains instructions for installation, operation and servicing of the processor. Read the User's Guide carefully to ensure reliable and satisfactory operation.

Technical Specifications

Film transport:	Continuous roller transport system
Film formats:	In general: Sheet and roll films up to 35.8 cm (14.1 in.) width; roll films with leader from 70 mm (2.8 in.) width; smallest film format 10x10 cm (4x4 in.).
Processing capacity:	35 x 43 cm: 62 films/hr
Process time:	105 sec
Tank capacities:	Developer, fixer and washing 5 litres each (1.3 gal)
Circulation system:	Developer and fixer are continuously circulated by a circulation pump
Replenishment:	Automatic replenishment by film detection, in relation to film length
Developer temperature:	Adjustable 28 - 37°C (82.4 - 98.6°F)
Fixer temperature:	Adjusted to developer temperature by heat exchanger.
Water connection:	Filtered water supply, 50 micron filter Permissible water pressure 20 - 85 psi, permissible water temperature 5 - 30°C (41 - 86°F).
Water consumption:	1.9 litres per minute (0.5 gal/min) when processing.
Drain capacity:	7 litres per minute (1.85 gal/min).
Noise level:	Less than 58 dB(A).
Heat emission:	Stand-by: 0.1 kJ/s Processing: 1.4 kJ/s
Environmental conditions:	1) Temperature 21 - 26°C (68 - 79°F), room temperature should be lower than set bath temperature. 2) Ventilation: 10 room air exchanges/hr. for a 3x3x3 m (10x10x10 ft) room. 3) Relative humidity 15% - 50% RH 4) Height above sea level less than 2000 m (6666 ft) 5) Indoor use
Power source:	120 V, 60 Hz, 15A, GFI protected
Power consumption:	1.4 kW/hr. when processing film 0.12 kW/hr in standby
Weight (processor):	Empty 35 kg (77 lbs) Filled 50 kg (110 lbs)
Dimensions (LxWxH):	77x59x42 (** 112) cm 30.3x23.2x16.5 (** 44.1) in.
Floor space required:	0.45 m ² (4.8 ft ²)

* Depending on gears used, processor has different speeds.

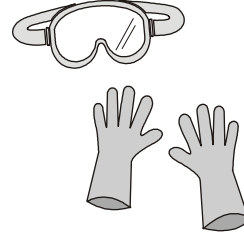
** Height including optional working table or base cabinet.

Safety Instructions

NOTE: Always follow local regulations for handling and disposing chemicals.

To ensure the safe operation of this processor, installation and use should always conform to the instructions contained in this manual.

Prior to handling, the Material Safety Data Sheets (MSDS's) and product labels, for the processor chemicals should be read and understood. MSDS's for Kodak products can be downloaded from the internet at www.kodak.com/go/msds. Safe handling measures outlined on the MSDS's for each product should be followed. Impervious gloves and protective clothing are recommended to prevent direct skin contact. Safety glasses with side shields, goggles, or a face shield are recommended to prevent accidental eye contact from a splash. Proper industrial hygiene practices should always be followed to prevent accidental ingestion. Promptly wash after handling these chemicals. Do not eat, drink, or smoke in areas where chemicals are used or stored. In addition, chemical-holding tanks should be equipped with tightly fitted lids to minimize chemical evaporation. Drains should be operating properly to prevent gases and vapors from backing up into the processing area. Spills and leaks should be cleaned up promptly.



Good general ventilation is recommended in x-ray processing areas and is typically defined as ten room changes of air per hour. Supplementary ventilation may be needed in special situations such as mixing operations, in poorly ventilated spaces, or in the event of evaporation from large surface areas.

Environmental regulations regarding the storage and disposal of waste chemicals should be obtained from the local water authorities and complied with.



Before opening the processor switch off the unit and unplug it from the electrical socket. Service and repairs must be performed by trained service technicians only. Use only manufacturers replacement parts.



Installation

1. Requirements for installation

- a. Filtered fresh water connection: Install a water filter between water tap and water connection of processor. Don't assemble the water filter directly to the solenoid valve of processor. Stop cock with 3/4 in. outer-thread diameter (washing machine connection), Water pressure 20 - 85 psi.
- b. Drainage connection: Plastic tube - inner diameter 50 mm (2 in.) or larger. A ventilated syphon which serves as odour preventor should be included in the planning. The drainage tubes should be installed with a fall of minimum 5%. Local Water Authorities regulations should be complied with.
- c. Electrical connection: Fused wall socket with earth connection according to electrical data (see [Technical Specifications, page 3](#)). It is also required to install an Earth-Leakage Switch (with 25 A / 30 mA nominal error current).



Electrical connections should be carried out according to regulations by an electrician.

2. Set up of processor

Unpack the processor. Remove cover and transport securing brackets on the sides of the roller racks. Remove roller racks - start with the dryer rack.

The processor is delivered as a tabletop processor with a three part floorplate. If the machine is upgraded with the optional stand or cabinet, both small PVC-parts have to be removed and main plate must be reconnected.

Table-top installation

For tabletop installation, screw on the adjustable feet.



Attention!
Machine should not be installed on table-top without adjustable feet, as this would block the ventilation openings under the machine and cause overheating.

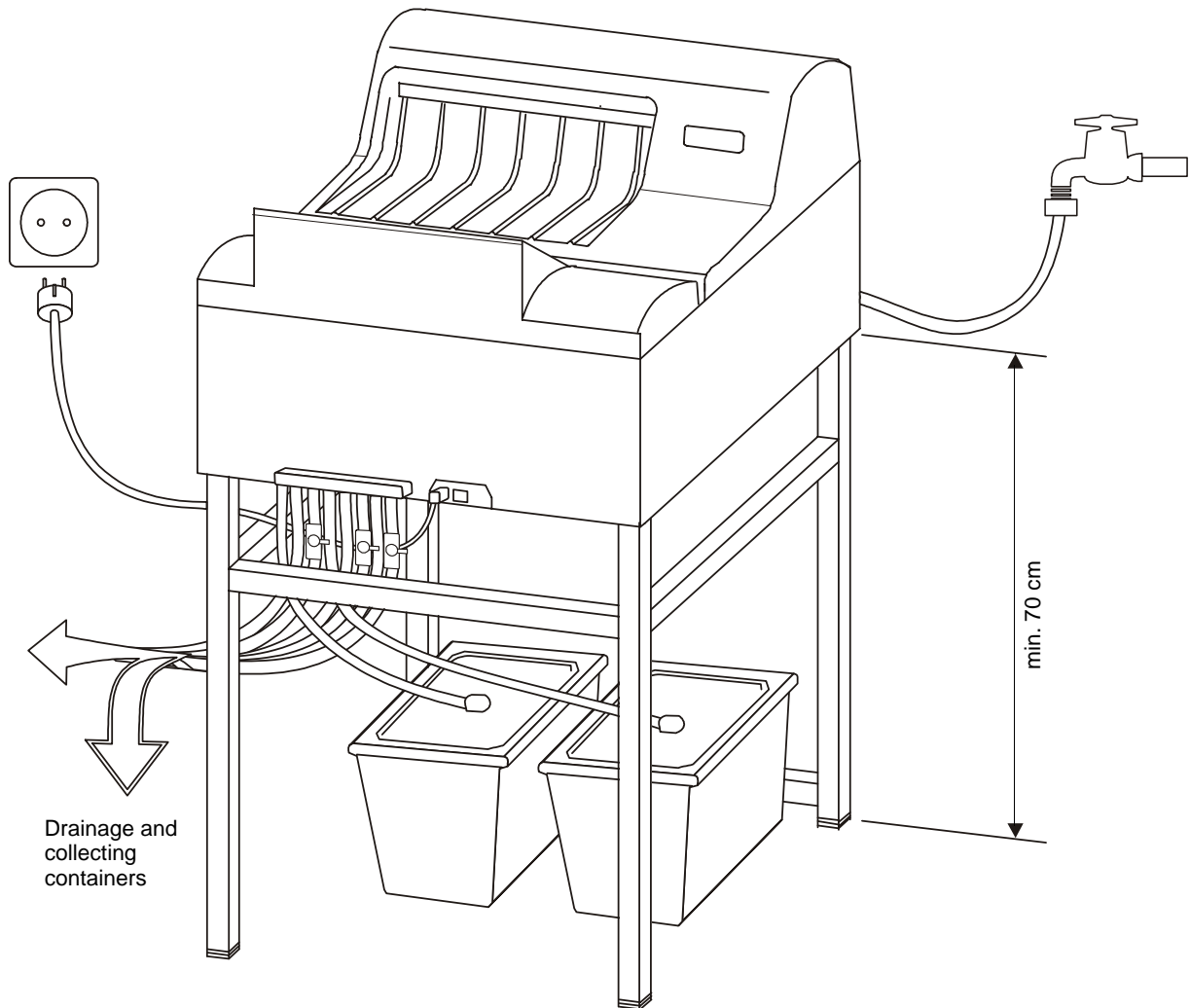
Installing on processor stand or base cabinet

For stand or cabinet installation, mount the processor directly on the stand or cabinet. Mount processor according to manual included with stand or cabinet (the adjustable feet inside the accessory bag are not required).

Level the processor:

Place spirit level across the sidewalls of processor and adjust the levelling feet accordingly. Replace the racks into the processor and close the latches.

3. Connecting the processor



Water connection: Connect the water hose from the back of the processor to the filtered fresh water supply.

All other hoses (see diagram [Page 7](#)): Connect the enclosed hoses according to colour system onto the front of the machine. Put hose clip (enclosed in accessory bag) over hose end, before attaching to connection. Warm up hose end (with hot water) and push onto the respective connection. Push the clip over hose and connection.

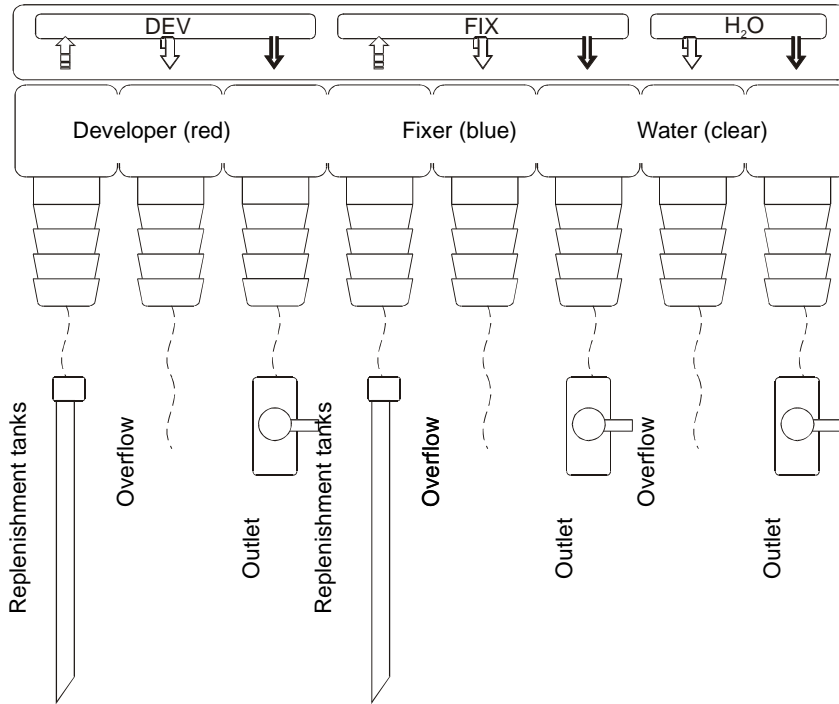
Cut hoses to required length. Then integrate the stop cocks into the three drainage hoses in such a position, that they are easy to reach.

Connect the suction pipes to the hose ends for the replenishment tanks using hose clips. Put suction pipes through cover opening into respective replenishment tanks and snap them in.




Place the developer and fixer overflow and drainage hoses into their respective collecting containers.

The overflow and the drainage of the water can either be placed into the drainage syphon or into respective collection containers.

Hose connections



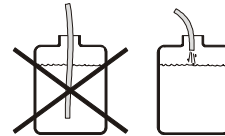
Pay attention to the correct colour connections:
Developer: red; fixer: blue; water: clear

-  Replenishment
-  Overflow
-  Outlet

Danger of Overflow!



Use the included cable binders (accessory bag) to secure the hoses. Fix all hose ends which guide into syphon or collecting container, so that they do not drop into the liquid.



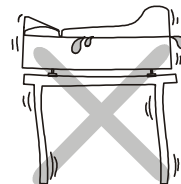
Very important:



The hoses should be as short as possible and without bends and kinks. This is very important for the water overflow hose or an overflow may occur.



Inform yourself of the local authority regulations regarding drainage. In addition, the x-ray processing product's MSDS's will provide guidance on disposal of used chemicals. These regulations may differ from information in this manual, but they should be complied with.



If the machine is installed table-top, ensure that the table is stable and does not wobble.

Initial Operation

1. Test run



Important!
Processor should not be run dry!

- a. Close the three drainage stop cocks and fill the tanks and replenishment containers with water. Open water inflow tap. Connect electrical socket and switch the machine on. Water now flows into water tank. The circulation pump activates, however the hosing of the machine must be ventilated.
- b. Ventilation of the replenishment pump:
Set temperature dial to position "Manual pumping". Keep dial to this position until no more air bubbles rise in the tanks.
- c. Ventilation of the circulation pump:
If air is in the circulation pump, a loud running noise can be heard. Switch the machine off again. Open the stop cocks of the developer and fixer for five seconds and switch machine on again. Repeat this procedure until no more air bubbles are visible in the developer and fixer baths and until the circulation pump runs quietly.
- d. Check all hose connections for leakage. Switch machine off and drain water out.

2. Install racks



Important!
Be careful to install racks properly and in correct position.

- a. Install racks, starting with developer (red), then fixer (blue), then dryer (beige).
- b. Make sure they are seated properly, so film transports correctly.
- c. Latch racks securely.



Important notice:
Ensure that the racks are firmly installed and keep the securing latches on the drive shafts closed.
Don't operate processor with empty replenishment tanks.

3. Fill processor with chemicals

Prepare chemicals inside the replenishment containers according to manufacturers instructions. Refer to the chemicals MSDS for proper handling guidelines.

Note: Kodak chemicals are recommended for use with Kodak films.

Fill up processor manually

By using a suitable container, pour chemicals into the respective tanks. First the fixer and then the developer. Caution: when filling, be sure that chemicals do no splash from one bath into another. When fixer solution is mixed with developer solution, the developer chemical is destroyed.

Snap each suction pipe into the respective cover of it's replenishment container and close it carefully. Place containers under processor.

Using replenishment pump

Filling of processor can also be done by use of the replenishment pump (this takes much more time). Snap each suction pipe into the respective cover of its replenishment container and close it carefully. Place containers under processor. Now set temperature dial to "Manual pumping". Keep dial in this position until tanks are filled. After 20 minutes this function stops automatically - to restart a cycle, turn dial to another position and return to "Manual pumping". *Limitation:* The function may fill up tanks of developer and fixer to different levels. This may be due to different causes. If this happens, then use a suitable container to fill up the tanks completely.

Operation

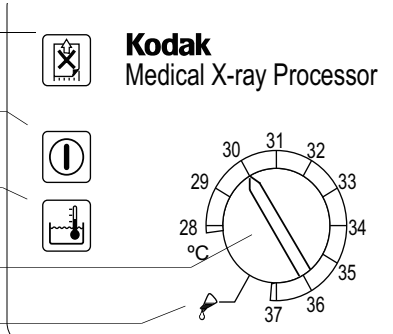
Control panel

LED displays

- **Film feed**
Wait with the next film until light goes off.
- **Power**
When power is on the LED lights up.
- **Bath temperature**
Flashes when temperature is not reached.

Temperature dial

Manual pumping



Important!

Safety interlock stops film transportation when cover is removed. Therefore keep cover placed on the machine when processing films.

Startup

1. Close water-drainage stop cock.
2. Open water tap for water supply.
3. Switch processor on.
4. Check liquid level in replenishment and drainage collecting containers.
5. Wait until the developer temperature is reached. If the temperature has not been reached, the bath temperature light is flashing.
6. Run cleaning films through processor.

Working procedure

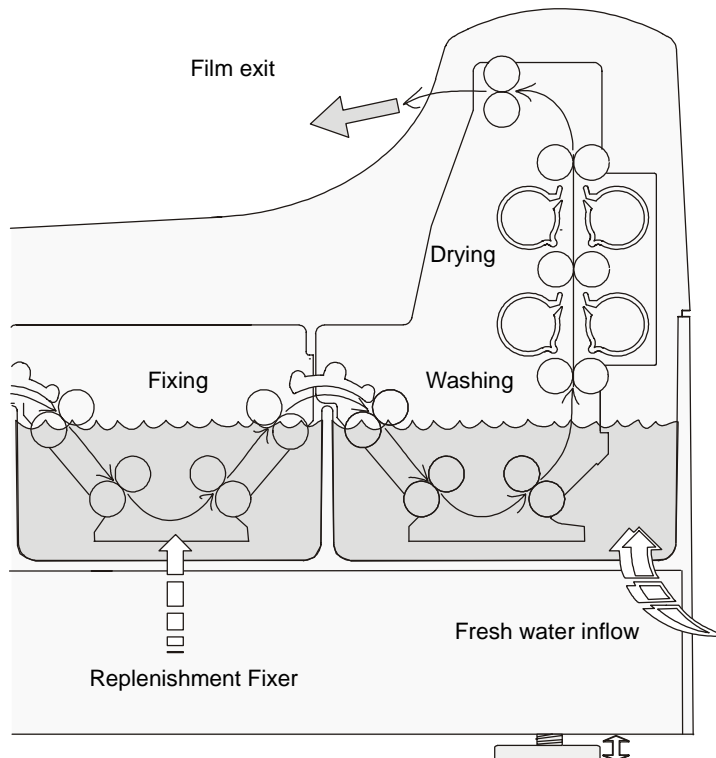
7. Processing films:
Open light protection cover. Important: Put film first on left side of feed tray and then feed in. During processing films please watch the display "Infeeding film". If this is lit, wait until it goes off again and an audible signal can be heard, before inserting the next film.

Shutdown

8. Switch processor off.
9. Close water tap.
10. Open water-drainage stop cock and drain water out of the machine.

Stand-by mode

When no film is being processed, the machine switches to Stand-by. The chemicals remain at a constant temperature. The film transport and water inflow activate at intervals to avoid crystallisation of the chemicals on the transport rollers. Entry of the next film is possible at any time.



Switching the machine on

The processor is switched on at the main switch on the front side. After switching on, the water tank will be filled up and a replenishment cycle will be carried out. The developer bath will be heated up. Until the temperature is reached the LED-display "Bath temperature" will be flashing. When the processor is ready and the bath temperature reached, a long signal tone can be heard.

Bath temperature

The processor heats up the chemicals automatically to the dial-set temperature. When this temperature is reached for the first time after switching on the machine, a long signal tone can be heard. This is also the case when the temperature is changed by the dial switch.

If the difference between actual and dial-set temperature is more than 1°C, the bath temperature LED will flash. If a film has been fed in and the temperature is not reached, a warning sound will be heard.

Display "Film Feed"

The light "Film Feed" is on during feeding of film. After the film has been fed in completely the light goes off. Additionally an audible signal indicates that the next film can be fed in. If films are fed into the processor without clearance one after another, then this may cause a film jam.

Manual pumping

The function "Manual pumping" activates the replenishment pump and pumps chemicals into the tanks in addition to automatic replenishment. Turn the dial to the position "Manual pumping" and chemicals will be pumped into the tanks. This function is only available during stand-by (no film in process). If the dial is left in this position, the pumping function is stopped automatically after 20 minutes. To restart a cycle turn, dial to a temperature and return to "Manual pumping".

Please note: Films cannot be processed when dial is set to "Manual pumping". Also bath temperature is set automatical to 28°C during "Manual pumping". After ending the manual pumping the temperature must be set again by turning the dial. It takes some time until the temperature is reached (look at the bath temperature display).

Remark: Both chemical pumps - fixer and developer - are driven parallel by only one motor and therefore they run simultaneously.

Anticrystallisation function

During the stand-by mode, the film transport, the dryer blower, the dryer heating and the water inflow are activated every 20 minutes for a period of 20 seconds. This prevents the build-up of crystals on the rollers.

Time replenishment (Anti oxidation function, Flooded replenishment)

Also during the stand-by, the developer chemicals are subject to change which causes their deterioration. By means of the time replenishment, a replenishment cycle is activated after 60 minutes without replenishment. The pump runs for 15 seconds. With this function, the quality of the developer chemicals are maintained even when standing idle for long periods.

Automatic replenishment

The chemicals are replenished automatically based on the amount of film processed. This is done by pumping chemicals from the replenishment containers. The film-detection switch calculates the processed film surface area at the film-infeed and after 0,25 m², a replenishment cycle of 40 seconds duration is automatically activated. The replenishment quantity per cycle (at pump setting 100%) amounts to 150 ml. The chart below shows the replenishment rate in ml per m² film surface in reliance on film width and setting of the pump.

Film width	Replenishment Rate	
	Setting of replenishment pump	
	85%**	62%
35 cm	600 ml/m ²	450 ml/m ²
24 cm	870 ml/m ²	650 ml/m ²
18 cm	1150 ml/m ²	875 ml/m ²

**Standard setting

Daily Care

Before use

- Remove dirt and dust from film-infeed with soft cloth.
- Run 2 - 3 clean-up films through processor to remove all accumulated dirt and dust from the rollers.
- Check the liquid level in the replenishment containers and if necessary refill.
- Leave light protection cover open when no film is in the processor. This avoids condensation on feed tray.

After use...

- When work has been completed at the end of the day, drain water out of the machine. This avoids the growth of algae in the water.



Attention: Do not let any liquid drop inside the processor or run over the control. Liquids may cause damage to the processor electronics.

Weekly Care

The developer chemicals cause residue buildup in the machine. This residue has a negative effect on the developing process of the film material. For this reason the processor should be regularly cleaned. Proceed as follows:

1. Switch machine off and remove cover.
2. Loosen the securing latches (red, blue and beige) of the drive shafts of each roller rack at the right side.
3. Wear protective equipment, outlined in the processing chemical's MSDS. First of all remove the large dryer-rack (beige). The racks are easier to remove and insert when they are slightly tilted. Remove the fixer (blue) and developer (red) racks in sequence.
4. Rinse all racks thoroughly under warm running water and then leave to drain off. It is advisable to use a soft sponge (do not use scouring-pad, as this would scratch the rollers) and remove the residue from the rollers.
5. Replace the racks: Red = Developer, Blue = Fixer. Beige = Washing/Drying. Ensure that the racks are firmly installed and do not forget to close the securing latches on the drive shafts.
6. Replace machine cover and ensure it is securely closed.
7. Clean processor outer shell with damp cloth. Do not use abrasive cleaners or solvents.



Please note: When removing the Rinsing / Drying roller-rack, ensure that no water gets into the film dryer air channel.

Thorough Cleaning

A thorough cleaning is necessary at a minimum of every three months. Tank cleaners are available for developer and water baths. The fixer bath is cleaned with water. When preparing chemical tank cleaners, follow manufacturers instructions explicitly and refer to the MSDS for safe handling guidelines. Discharge, treatment disposal of used chemicals may be subject to national, state or local laws or guidelines.

How to proceed:

1. Switch the machine off and empty all tanks by opening the stop cocks.
2. Remove machine cover. When all tanks are emptied, close stop cocks again. Now fill the fixer-tank with water. Prepare cleaner solutions for developer and water baths and fill into respective tanks.
3. Remove suction pipes from the replenishment containers and place them in a water filled bucket. Attention: Do not add chemical cleaners here!
4. Close machine cover and switch machine on.
5. Start film transportation and keep running for 10 to 20 minutes. Place a film in the infeed so that it activates the film switch but will not be pulled into the processor. During the operation with water, the installed roller racks will be cleaned.
6. Important: After completion of tank cleaning, the tank should be rinsed thoroughly with clean water. To do this, fill the machine with fresh water twice and each time, let the machine run for a 10 minute period. Empty the tanks and re-close the stop cocks.
7. Take out the roller-racks and rinse them thoroughly with running water. Remove remaining dirt from the rollers by using a sponge and clean thoroughly. Doing this, the rollers can be turned by turning the drive shaft. Remove the sheet metal covers from the dryer rack and clean the rack with mild soap. Reinstall the roller-racks in the machine.
8. Refill the tanks with respective chemicals. Replace the suction pipes into the replenishment containers. In certain circumstances the circulation system must be ventilated: see [Page 8](#), item 1c.
9. For quality check, process test films.

Extended shutdown

In the event that your processor will not be in use for longer than two weeks, all the chemicals have to be emptied out of the tanks. If you don't want to do a complete tank cleaning at this time, then fill the tanks with water after emptying.

Film Defects

Your processor has been constructed for long term use. If however irregularities might occur, you will find help to locate the problem below. Please check the listed points, before calling your service-technician.

Films do not have enough density

- Developer bath temperature is too low.
- Developing time is too short.
- Exposure time is too short.
- Replenishment rate of developer too low.
- Developer chemicals are exhausted or too strong diluted: Renew.
- Fixer solution has been mixed into developer: Renew. Clean and rinse bath well before refilling.
- Circulation is broken down.



Too high a density

- Developer bath temperature too high.
- Developing time too long.
- Exposure time is too long.
- Replenishment rate of developer too high.
- Developer chemicals are too high diluted: Renew.
- After renewing chemicals: Starter is missing.
- Circulation is broken down.



Films will not dry

Note: Depending on film type, you may need to switch to a longer processing cycle.

- If warm air exits the air channel in the dryer, verify you are using the correct processing cycle for the film type being used.
- Fixer solution is exhausted or diluted.



Film has a yellow-green surface.

- Improperly fixed film. Check the film type and fixer chemistry.
- Fixer solution is exhausted or diluted. Replenishment rate of fixer is too low.

Scratches, pressure marks, dirt on film

- Prior to processing films, run cleaner films through the processor.
- Pressure marks caused by careless handling, finger nails etc.
- Rollers are dirty or damaged. Clean tanks and roller racks or replace racks.



Cloudy film

- Level in developer is too low.
- First guide bar of fixer rack is dirty (condensate or crystals). Clean roller-racks.
- Developer is old or circulation not working.
- Try processing films by feeding them with emulsion side up.



Machine Errors

Machine does not switch on

- Ensure that electrical plug is firmly inserted into socket.
- Ensure that electrical socket has power supply by testing with an appliance (e.g. tablelight).



Machine does not start automatically

- Film switch left side at the infeed side of the processor has not been pressed down. Feed in the film to activate the switch.

Developer temperature too low

- The temperature dial is not set at the proper position (knob should not be set in between positions).

Replenishment pump does not pump

- Check whether the replenishment containers are full and that the end of the suction pipe is positioned under the liquid level.
- Check whether there is air in the replenishment pipes. If this is the case, then check the pipe connections.

Rinsing water does not flow

- Open water inflow tap.
- Water pressure in the water system is too low: Minimum pressure 2 bar (20 psi).

Water tank overflows

- Water drainage hose (overflow) is bent. The hose end should be positioned above the drainage level in the syphon (see diagram on [Page 7](#)).
- Water drainage in the tank, hoses and connections should be checked for blockage and pollution. The drainage hoses should be straight without bends or kinks.

The film will not feed but the dryer works

- Place cover firmly on machine, ensuring that the cover switch on the right front side has been activated.

The film does not transport correctly

- Film is fed in and gets caught in the machine: Check the positioning of the racks in the machine and make sure that the latches are closed.



Important notice:

Ensure that the racks are firmly installed and keep the securing latches on the drive shafts closed.

Don't operate processor with empty replenishment tanks.

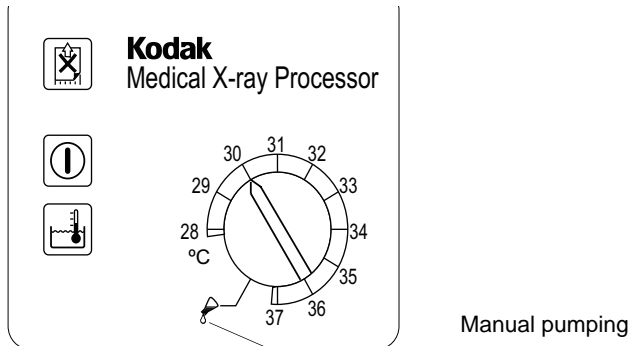
After a long machine shut down check bath level and refill if necessary.

Level Indicator

If the level of the developer falls below the ideal level the symbol "Manual pumping" appears until the ideal level is reached again.

To reach the ideal level please see "Manual pumping" on [Page 12](#) in the operating manual.

When the symbol "Manual pumping" disappears the pump-process can be stopped by turning the temperature switch on the same position you had before when starting "Manual pumping".



New Equipment Warranty

Warranty Coverage

Kodak warrants the processors to function properly for 1 year from date of initial installation, when installed within one year from the date of shipment.

If the equipment does not function correctly during the warranty period, the dealer that sold the equipment will provide or arrange for repair of the equipment during the dealer's normal working hours. Such repair service will include any necessary adjustments and/or replacement of parts necessary to maintain your equipment in good working order.

How to Obtain Service

Should equipment require service, see the sales contract for details on whom to call for service, or contact the dealer that sold you the equipment.

Limitations

- Warranty service is limited to the contiguous United States, the island of Oahu in Hawaii, and certain areas of Alaska.
- This warranty does not cover circumstances beyond Kodak's control, misuse, or abuse. Any attachments, accessories, or alterations not marketed by Kodak (including service or parts to correct problems resulting from the use of such attachments, accessories or alterations), failure to follow Kodak's operating instructions, or supply items.
- Kodak makes no other warranties, express, implied, or of merchantability for this equipment.
- Repair without charge is Kodak's and the dealer's only obligation under this warranty.
- Kodak will not be responsible for any consequential or incidental damages resulting from the sale, use, or improper functioning of this equipment even if loss or damage is caused by the negligence or other fault of Kodak.
- Such damages for which Kodak will not be responsible, include, but are not limited to, loss of revenue or profit, downtime costs, loss of use of the equipment, cost of any substitute equipment, facilities or services or claims of your customers for such damages.
- This limitation of liability will not apply to claims for injury to persons or damage to property caused by the sole negligence or fault of Kodak or by persons under its direction or control.